Complex Fractions

$$\frac{\frac{1}{2}+\frac{2}{3}}{\frac{1}{5}+\frac{1}{2}} = \frac{\frac{3}{6}+\frac{4}{6}}{\frac{2}{10}+\frac{5}{10}} = \frac{\frac{7}{6}}{\frac{7}{10}} = \frac{7}{6}\cdot\frac{10}{7} = \frac{5}{3}$$

fractions inside fractions

$$\frac{\frac{(x-2)x}{(x-2)x+2} - \frac{3(x+2)}{x-2(x+2)}}{\frac{(x+3)3x}{(x+3)x-2} - \frac{(x+2)(x-2)}{x+3(x-1)}} = \frac{\frac{x^2-2x-3x-6}{(x+2)(x-2)}}{\frac{3x^2+9x+(x^2+4)}{(x-2)(x+3)}} = \frac{\frac{x^2-5x-6}{(x+2)(x-2)}}{\frac{2x^2+9x+4}{(x-2)(x+3)}}$$

$$\frac{x^2-5x-6}{(x+2)(x-2)}\cdot\frac{(x-2)(x+3)}{2x^2+9x+4}$$

$$\frac{(x-6)(x+1)}{(x+2)(x-2)}\cdot\frac{(x-2)(x+3)}{(2x+1)(x+4)}$$

$$\frac{(x-6)(x+1)(x+3)}{(x+2)(2x+1)(x+4)}$$

Simplify

* No = sign
* Answer is a reduced expression usually with variables
* Make common denom, factor + cancel

February 14, 2025

SOLVING RATIONAL EQUATIONS

Simplify

* Results in an expression with variables
* No = sign

Solve

* Results in x = #
* Contains = sign

* multiply by the common denominator!

$21\left[\frac{x}{3} + \frac{x}{7} = \frac{2}{21}\right]$

$7x + 3x = 42$

$\frac{10x}{10} = \frac{42}{10}$

$x = \frac{21}{5}$

$$\frac{x+5}{x^3+x^2} - \frac{2}{x^2-2x} = \frac{-3}{x^2-x-2}$$

$$x^2(x+1)(x-2)\left[\frac{x+5}{x^2(x+1)} - \frac{2}{x(x-2)} = \frac{-3}{(x-2)(x+1)}\right]$$

$$(x-2)(x+5) - 2x(x+1) = -3x^2$$

$$x^2 + 5x - 2x - 10 - 2x^2 - 2x = -3x^2$$

$$-x^2 + x - 10 = -3x^2$$

$$+3x^2$$

$$2x^2 + x - 10 = 0$$

$$(2x+5)(x-2) = 0$$

$$2x+5=0 \qquad x-2=0$$

$$\frac{2x}{2} = \frac{-5}{2} \qquad x = 2$$

extraneous solution

1) Factor the denominators
2) Check for excluded values
$x \neq 0, -1, 2$
3) Multiply by the common denom + cancel all denom
4) Write down all terms that are left
5) Combine like terms set $= 0$, + solve
6) Check for excluded values

$(w-4)(w+1)\left[w+\frac{w+7}{w^2-3w-4}\right]=\frac{w^2}{w-4}(w-4)(w+1)$ $\quad w\neq 4,-1$

$(w-4)(w+1)$ $\quad (w-4)(w+1)$

$w(w-4)(w+1)+w+7=w^2(w+1)$

$w(w^2-3w-4)$

$w^3-3w^2-4w+w+7=w^3+w^2$

$w^3-3w^2-3w+7=w^3+w^2$

$0=4w^2+3w-7$

$0=(4w+7)(w-1)$

$w=-7/4 \quad w=1$ ← check for excluded values! (All are OK.)